CLAIMS

1. A method of transmitting signaling information from a first device to a second device, wherein data transmitted between the first device and the second device is encoded using a first block coding scheme, the method comprising acts of:

(A) encoding the signaling information as one or more first sequences of bits;

(B) multiplexing the one or more first sequences of bits with first data encoded in accordance with the first block coding scheme to produce a first stream of data encoded in accordance with the first block coding scheme; and

(C) transmitting the first stream of data from the first device to the second device.

2. The method of claim 1, wherein the method further comprises acts of:

(D) de-multiplexing the one or more first sequences of bits from the first stream of data; and

(E) decoding the one or more first sequences of bits into the signaling information.

3. The method of claim 1, wherein the first device is operative to transmit data according to a first protocol, and acts (A) and (B) are performed at a physical layer of the first protocol.

4. The method of claim 3, wherein the first protocol is an Ethernet-based protocol.

5. The method of claim 1, wherein act (A) comprises an act of:

encoding the signaling information such that each of the first sequences of bits is not a sequence of bits defined by the first block coding scheme.

6. The method of claim 1, wherein act (A) comprises acts of:

(1) dividing the signaling information into one or more second sequences of bits; and

(2) for each of the one or more second sequences, encoding the second sequence as one or more of the first sequences.

7. The method of claim 6, wherein the first block coding scheme is an 8B/10B block coding scheme, and act (A)(1) comprises an act of dividing the signaling information into one or more second sequences of eight bits, and act (A)(2) comprises an act of encoding each of the one or more second sequences of eight bits such that each of the first sequences of bits has a number of bits equal to ten.

8. The method of claim 7, wherein act (A)(2) further comprises an act of:

encoding each second sequence of bits such that each of the first sequences of bits is not a 10-bit code word defined by the 8B/10B block coding scheme.

9. The method of claim 7, wherein act (A)(2) comprises an act of:

encoding each second sequence such that, for each of the first sequences, a number of bits of the first sequence having a first logical value is either less than four or greater than six.

10. The method of claim 9, wherein the first logical value is a logical one.

11. The method of claim 9, wherein the first logical value is a logical zero.

12. The method of claim 9, wherein act (A)(2), for each second sequence of bits, comprises acts of:

(a) determining a number of bits of the second sequence having a first logical value; and

(b) generating one or more of the first sequences from the second sequence based on the number of bits of the first sequence having a first logical value such that, for each generated first sequence of bits, a number of bits having a first logical value is greater than six or less than four.

13. The method of claim 12, wherein, for each second sequence of bits, if the number of bits determined to have a first logical value is equal to four, act (A)(2)(b) further comprises acts of:

dividing the second sequence of bits into two segments having a number of bits equal to four; and

for each segment, appending six bits to a first end of the segment to produce one of the first sequences.

14. The method of claim 12, wherein, for each second sequence of bits, if the number of bits determined to have a first logical value is less than four or greater than six, act (A)(2) further comprises an act of:

appending two bits to an end of the second sequence to produce one of the first sequences of bits, wherein each of the two bits has a second logical value.

15. The method of claim 12, wherein, for each second sequence of bits, if the number of bits determined to have a first logical value is equal to five, act (A)(2) further comprises an act of:

appending two bits to an end of the second sequence to produce one of the first sequences of bits, wherein each bit has a first logical value.

16. The method of claim 12, wherein, for each second sequence of bits, if the number of bits determined to have a first logical value is equal to six, act (A)(2) further comprises an act of:

appending two bits to an end of the second sequence to produce one of the first sequences of bits, wherein one of the bits has a first logical value and one of the bits has a second logical value.

17. The method of claim 1, wherein the first device is a network device of an optical transport network, and the second device is a network device external to the optical transport network.

18. The method of claim 17, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

19. The method of claim 1, wherein the second device is a network device of an optical transport network, and the first device is a network device external to the optical transport network.

20. The method of claim 19, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

21. The method of claim 1, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

22. A system for transmitting signaling information from a first device to a second device, wherein data transmitted between the first device and the second device is encoded using a first block coding scheme, the system comprising:

the first device comprising an encoder to encode the signaling information as one or more first sequences of bits, a multiplexer to multiplex the one or more first sequences of bits with first data encoded in accordance with the first block coding scheme to produce a first stream of data encoded in accordance with the first block coding scheme, and an output to transmit the first stream of data from the first device to the second device.

23. The system of claim 22, wherein the system further comprises:

the second device comprising an input to receive the first stream of data, a demultiplexer to de-multiplex the one or more first sequences of bits from the first stream of data, and a decoder to decode the one or more first sequences of bits into the signaling information.

24. The system of claim 22, wherein the first device is operative to transmit data according to a first protocol, and to perform acts (A) and (B) at a physical layer of the first protocol.

25. The system of claim 24, wherein the first protocol is an Ethernet-based protocol.

26. The system of claim 22, wherein the encoder is operative to encode the signaling information such that each of the first sequences of bits is not a sequence of bits defined by the first block coding scheme.

27. The system of claim 22, wherein the first device further comprises

a signal divider to divide the signaling information into one or more second sequences of bits, and

wherein the encoder is further operative, for each of the one or more second sequences, to encode the second sequence as one or more of the first sequences.

28. The system of claim 27, wherein the first block coding scheme is an 8B/10B block coding scheme, and the signal divider is operative to divide the signaling information into one or more second sequences of eight bits, and the encoder is further operative to encode each of the one or more second sequences of eight bits such that each of the first sequences of bits has a number of bits equal to ten.

29. The system of claim 28, wherein the encoder is further operative to encode each second sequence of bits such that each of the first sequences of bits is not a 10-bit code word defined by the 8B/10B block coding scheme.

30. The system of claim 28, wherein the encoder is further operative to encode each second sequence such that, for each of the first sequences, a number of bits of the first sequence having a first logical value is either less than four or greater than six.

31. The system of claim 30, wherein the first logical value is a logical one.

32. The system of claim 30, wherein the first logical value is a logical zero.

33. The system of claim 30, wherein the encoder is further operative, for each second sequence of bits, to determine a number of bits of the second sequence having a first logical value, and to generate one or more of the first sequences from the second sequence based on the number of bits of the first sequence having a first logical value such that, for each generated first sequence of bits, a number of bits having a first logical value is greater than six or less than four.

34. The system of claim 33, wherein the encoder is further operative, for each second sequence of bits, if the number of bits determined to have a first logical value is equal to

four, to divide the second sequence of bits into two segments having a number of bits equal to four, and, for each segment, append six bits to a first end of the segment to produce one of the first sequences.

35. The system of claim 33, wherein the encoder is further operative, for each second sequence of bits, if the number of bits determined to have a first logical value is less than four or greater than six, to append two bits to an end of the second sequence to produce one of the first sequences of bits, wherein each of the two bits has a second logical value.

36. The system of claim 33, wherein the encoder is further operative, for each second sequence of bits, if the number of bits determined to have a first logical value is equal to five, to append two bits to an end of the second sequence to produce one of the first sequences of bits, wherein each bit has a first logical value.

37. The system of claim 33, wherein, the encoder is further operative, for each second sequence of bits, if the number of bits determined to have a first logical value is equal to six, to append two bits to an end of the second sequence to produce one of the first sequences of bits, wherein one of the bits has a first logical value and one of the bits has a second logical value.

38. The system of claim 22, wherein the first device is a network device of an optical transport network, and the second device is a network device external to the optical transport network.

39. The system of claim 38, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

40. The system of claim 22, wherein the second device is a network device of an optical transport network, and the first device is a network device external to the optical transport network.

41. The system of claim 40, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

42. The system of claim 22, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

43. A system for transmitting signaling information from a first device to a second device, wherein data transmitted between the first device and the second device is encoded using a first block coding scheme, the system comprising:

means for encoding the signaling information as one or more first sequences of bits;

means for multiplexing the one or more first sequences of bits with first data encoded in accordance with the first block coding scheme to produce a first stream of data encoded in accordance with the first block coding scheme; and

means for transmitting the first stream of data from the first device to the second device.

44. The system of claim 43, wherein the system further comprises:

means for de-multiplexing the one or more first sequences of bits from the first stream of data; and

means for decoding the one or more first sequences of bits into the signaling information.

45. The system of claim 43, wherein the first device is operative to transmit data according to a first protocol, the means for encoding comprises means to encode at a physical layer of the first protocol, and the means for multiplexing comprises means to multiplex at the physical layer of the first protocol.

46. The system of claim 3, wherein the first protocol is an Ethernet-based protocol.

47. The system of claim 43, wherein the means for encoding comprises:

means for encoding the signaling information such that each of the first sequences of bits is not a sequence of bits defined by the first block coding scheme.

48. The system of claim 43, wherein the system further comprises:

means for dividing the signaling information into one or more second sequences of bits, and

wherein means for encoding comprises means for encoding, for each of the one or more second sequences, the second sequence as one or more of the first sequences.

49. The system of claim 48, wherein the first block coding scheme is an 8B/10B block coding scheme, the means for dividing comprises means for dividing the signaling information into one or more second sequences of eight bits, and the means for encoding further comprises means for encoding each of the one or more second sequences of eight bits such that each of the first sequences of bits has a number of bits equal to ten.

50. The system of claim 49, wherein the means for encoding further comprises:

means for encoding each second sequence of bits such that each of the first sequences of bits is not a 10-bit code word defined by the 8B/10B block coding scheme.

51. The system of claim 49, wherein the means for encoding further comprises:

means for encoding each second sequence such that, for each of the first sequences, a number of bits of the first sequence having a first logical value is either less than four or greater than six.

52. The system of claim 51, wherein the first logical value is a logical one.

53. The system of claim 51, wherein the first logical value is a logical zero.

54. The system of claim 51, wherein the means for encoding further comprises, for each second sequence of bits:

means for determining a number of bits of the second sequence having a first logical value; and

means for generating one or more of the first sequences from the second sequence based on the number of bits of the first sequence having a first logical value such that, for each generated first sequence of bits, a number of bits having a first logical value is greater than six or less than four.

55. The system of claim 54, wherein the means for encoding further comprises, for each second sequence of bits, if the number of bits determined to have a first logical value is equal to four:

means for dividing the second sequence of bits into two segments having a number of bits equal to four; and

means for appending, for each segment, six bits to a first end of the segment to produce one of the first sequences.

56. The system of claim 54, wherein the means for encoding further comprises, for each second sequence of bits, if the number of bits determined to have a first logical value is less than four or greater than six:

means for appending two bits to an end of the second sequence to produce one of the first sequences of bits, wherein each of the two bits has a second logical value.

57. The system of claim 54, wherein the means for encoding further comprises, for each second sequence of bits, if the number of bits determined to have a first logical value is equal to five

means for appending two bits to an end of the second sequence to produce one of the first sequences of bits, wherein each bit has a first logical value.

58. The system of claim 54, wherein the means for encoding further comprises, for each second sequence of bits, if the number of bits determined to have a first logical value is equal to six:

means for appending two bits to an end of the second sequence to produce one of the first sequences of bits, wherein one of the bits has a first logical value and one of the bits has a second logical value.

59. The system of claim 54, wherein the first device is a network device of an optical transport network, and the second device is a network device external to the optical transport network.

60. The system of claim 59, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

61. The system of claim 43, wherein the second device is a network device of an optical transport network, and the first device is a network device external to the optical transport network.

62. The system of claim 61, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

63. The system of claim 43, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

64. A computer program product, comprising:

a computer-readable medium; and

computer-readable signals stored on the computer-readable medium that define instructions that, as a result of being executed by a computer, instruct the computer to perform a process of transmitting signaling information from a first device to a second device, wherein data transmitted between the first device and the second device is encoded using a first block coding scheme, the process comprising acts of:

(A) encoding the signaling information as one or more first sequences of bits;

(B) multiplexing the one or more first sequences of bits with first data encoded in accordance with the first block coding scheme to produce a first stream of data encoded in accordance with the first block coding scheme; and

(C) transmitting the first stream of data from the first device to the second device.

65. A method of extracting signaling information from a first stream of data encoded in accordance with a first block coding scheme, wherein the signaling information has been encoded as one or more first sequences of bits and multiplexed with first data

encoded in accordance with the first block coding scheme to produce the first stream of data, the method comprising acts of:

(A) receiving the first stream of data;

(B) de-multiplexing the one or more first sequences of bits from the first stream of data; and

(C) decoding the one or more first sequences of bits into the signaling information.

66. The method of claim 65, wherein the first device is operative to exchange data according to a first protocol, and acts (B) and (C) are performed at a physical layer of the first protocol.

67. The method of claim 66, wherein the first protocol is an Ethernet-based protocol.

68. The method of claim 65, wherein the signaling information had been divided into one or more second sequences of bits, and the one or more second sequences of bits has been encoded as the one or more first sequences, and act (C) comprises an act of:

(1) decoding the one or more of the first sequences into one or more second sequences .

69. The method of claim 68, wherein the first block coding scheme is an 8B/10B block coding scheme, the signaling information had been divided into one or more second sequences of eight bits, and each of the one or more second sequences of eight bits has been encoded such that each of the first sequences of bits has a number of bits equal to ten.

70. The method of claim 69, wherein, for each first sequence of bits, act (C)(1) comprises acts of:

(a) determining a first value of a first bit at a first predefined position of the first sequence;

(b) determining a second value of a second bit at a second predefined position of the first sequence; and

(c) generating, from each first sequence of bits, at least part of one of the second sequences of bits based on the first value and the second value.

71. The method of claim 70, wherein, for each first sequence of bits, if it is determined in acts (C)(1)(a) and (b) that a first order of the first bit and the second bit forms a first combination of values, then act (C)(1)(c) further comprises acts of:

removing, from the first sequence, the first bit, the second bit, and four bits at four predefined positions of the first sequence, respectively; and

combining the remaining four bits with four bits from another first sequence to produce one of the second sequences of bits.

72. The method of claim 70, wherein, for each first sequence of bits, if it is determined in acts (C)(1)(a) and (b) that a first order of the first bit and the second bit does not form a first combination of values, then act (C)(1)(c) further comprises an act of:

removing the first bit and the second bit from the first sequence to produce one of the second sequences.

73. The method of claim 65, wherein act (B) comprises:

for each of the one or more first sequences, determining that the first sequence is not a sequence of bits defined by the first block coding scheme.

74. The method of claim 65, wherein acts (A), (B) and (C) are performed by a network device that is part of an optical transport network, and the first stream of data is received from a network device external to the optical transport network.

75. The method of claim 74, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

76. The method of claim 65, wherein acts (A), (B) and (C) are performed by a network device external to an optical transport network, and the first stream is received from a network device that is part of the optical transport network.

77. The method of claim 76, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

78. The method of claim 65, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

79. A system for extracting signaling information from a first stream of data encoded in accordance with a first block coding scheme, wherein the signaling information has been encoded as one or more first sequences of bits and multiplexed with first data encoded in accordance with the first block coding scheme to produce the first stream of data, the system comprising:

an input to receive the first stream of data;

a demultiplexer to de-multiplex the one or more first sequences of bits from the first stream of data;

and a decoder to decode the one or more first sequences of bits into the signaling information.

80. The system of claim 79, wherein the system is operative to exchange data according to a first protocol, and the demultiplexer is operative to de-multiplex the one or more first sequences at the physical layer of the first protocol, and the decoder is operative to decode the one or more first sequences at the physical layer of the first protocol.

81. The system of claim 80, wherein the first protocol is an Ethernet-based protocol.

82. The system of claim 79, wherein, the signaling information had been decoded as one or more second sequences of bits, and the one or more second sequences has been encoded as the one or more first sequences, and

wherein the decoder is further operative to decode the one or more first sequences into the one or more second sequences.

83. The system of claim 82, wherein the first block coding scheme is an 8B/10B block coding scheme, the signaling information has been divided into one or more

second sequences of eight bits, and each of the one or more second sequences of eight bits has been encoded such that each of the first sequences of bits has a number of bits equal to ten.

84. The system of claim 83, wherein the decoder is further operative to determine a first value of a first bit at a first predefined position of the first sequence, to determine a second value of a second bit at a second predefined position of the first sequence, and to generate, from each first sequence of bits, at least part of one of the second sequences of bits based on the first value and the second value.

85. The system of claim 84, wherein, the decoder is further operative such that, for each first sequence of bits, if it is determined that a first order of the first bit and the second bit forms a first combination of values, then the decoder removes, from the first sequence, the first bit, the second bit, and four bits at four predefined positions of the first sequence, respectively, and combines the remaining four bits with four bits from another first sequence to produce one of the second sequences of bits.

86. The system of claim 84, wherein the decoder is further operative such that, for each first sequence of bits, if it is determined that a first order of the first bit and the second bit does not form a first combination of values, then the decoder removes the first bit and the second bit from the first sequence to produce one of the second sequences.

87. The system of claim 79, wherein the de-multiplexer is operative to determine, for each of the first sequences of bits, that the first sequence is not a sequence of bits defined by the first block coding scheme.

88. The system of claim 79, wherein the system is at least part of a network device of an optical transport network, and the first stream of data is received from a network device external to the optical transport network.

89. The system of claim 88, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

90. The system of claim 79, wherein the system is at least part of a network device external to an optical transport network second device and the first stream of data is received from a network device which is part of an optical transport network.

91. The system of claim 90, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

92. The system of claim 79, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

93. A system for extracting signaling information from a first stream of data encoded in accordance with a first block coding scheme, wherein the signaling information has been encoded as one or more first sequences of bits and multiplexed with first data encoded in accordance with the first block coding scheme to produce the first stream of data, the system comprising:

means for receiving the first stream of data;

means for de-multiplexing the one or more first sequences of bits from the first stream of data; and

means for decoding the one or more first sequences of bits into the signaling information.

94. The system of claim 93, wherein the system is operative to exchange data according to a first protocol, and the means for de-multiplexing comprises means for de-multiplexing the one or more first sequences at a physical layer of the first protocol, and the means for decoding comprises means for decoding the one or more first sequences at the physical layer of the first protocol.

95. The system of claim 94, wherein the first protocol is an Ethernet-based protocol.

96. The system of claim 93, wherein the signaling information had been divided into one or more second sequences of bits, and the one or more second sequences of bits has been encoded as the one or more first sequences of bits, and wherein the means for decoding comprises:

means for decoding the one or more of the first sequences into the one or more second sequences.

97. The system of claim 96, wherein the first block coding scheme is an 8B/10B block coding scheme, the signaling information has been divided into one or more second sequences of eight bits, and each of the one or more second sequences of eight bits has been encoded such that each of the first sequences of bits has a number of bits equal to ten..

98. The system of claim 97, wherein the means for decoding comprises, for each first sequence of bits:

means for determining a first value of a first bit at a first predefined position of the first sequence;

means for determining a second value of a second bit at a second predefined position of the first sequence; and

means for generating, from each first sequence of bits, at least part of one of the second sequences of bits based on the first value and the second value.

99. The system of claim 98, wherein the means for decoding further comprises, for each first sequence of bits, if it is determined that a first order of the first bit and the second bit forms a first combination of values:

means for removing, from the first sequence, the first bit, the second bit, and four bits at four predefined positions of the first sequence, respectively; and

means for combining the remaining four bits with four bits from another first sequence to produce one of the second sequences of bits.

100. The system of claim 98, wherein the means for decoding further comprises, for each first sequence of bits, if it is determined that a first order of the first bit and the second bit does not form a first combination of values:

means for removing the first bit and the second bit from the first sequence to produce one of the second sequences.

101. The system of claim 93, wherein the means for de-multiplexing comprises:

means for determining, for each of the one or more first sequences, that the first sequence is not a sequence of bits defined by the first block coding scheme.

102. The system of claim 93, wherein the system is at least part of a network device that is part of an optical transport network, and the first stream of data is received from a network device external to the optical transport network.

103. The system of claim 102, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

104. The system of claim 93, wherein the system is at least part of a network device external to an optical transport network, and the first stream is received from a network device that is part of the optical transport network.

105. The system of claim 104, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

106. The system of claim 93, wherein the signaling information is defined in accordance with the Optical Domain Service Interconnect.

107. A computer program product, comprising:

a computer-readable medium; and

computer-readable signals stored on the computer-readable medium that define instructions that, as a result of being executed by a computer, instruct the computer to perform a process of extracting signaling information from a first stream of data encoded in accordance with a first block coding scheme, wherein the signaling information has been encoded as one or more first sequences of bits and multiplexed with first data encoded in accordance with the first block coding scheme to produce the first stream of data, the process comprising acts of:

(A) receiving the first stream of data;

(B) de-multiplexing the one or more first sequences of bits from the first stream of data; and

(C) decoding the one or more first sequences of bits into the signaling information.

108. A method of transmitting signaling information from a first device to a second device, wherein data transmitted between the first device and the second device is encoded using a first block coding scheme, the method comprising acts of:

(A) encoding the signaling information as one or more first sequences of bits;

(B) multiplexing the one or more first sequences of bits with first data encoded in accordance with the first block coding scheme to produce a first stream of data encoded in accordance with the first block coding scheme;

(C) transmitting the first stream of data from the first device to the second device;

(D) de-multiplexing the one or more first sequences of bits from the first stream of data; and

(E) decoding the one or more first sequences of bits into the signaling information.

109. A system for transmitting signaling information from a first device to a second device, wherein data transmitted between the first device and the second device is encoded using a first block coding scheme, the system comprising:

a first device comprising an encoder to encode the signaling information as one or more first sequences of bits, a multiplexer to multiplex the one or more first sequences of bits with first data encoded in accordance with the first block coding scheme to produce a first stream of data encoded in accordance with the first block coding scheme, and an output to transmit the first stream of data from the first device to the second device; and

a second device comprising an input to receive the first stream of data, a demultiplexer to de-multiplex the one or more first sequences of bits from the first stream of data and a decoder to decode the one or more first sequences of bits into the signaling information.

110. A system for transmitting signaling information from a first device to a second device, wherein data transmitted between the first device and the second device is encoded using a first block coding scheme, the system comprising:

means for encoding the signaling information as one or more first sequences of bits;

means for multiplexing the one or more first sequences of bits with first data encoded in accordance with the first block coding scheme to produce a first stream of data encoded in accordance with the first block coding scheme;

means for transmitting the first stream of data from the first device to the second device;

means for de-multiplexing the one or more first sequences of bits from the first stream of data; and

means for decoding the one or more first sequences of bits into the signaling information.

1N. A computer program product, comprising:

a computer-readable medium; and

computer-readable signals stored on the computer-readable medium that define instructions that, as a result of being executed by a computer, instruct the computer to perform a process of transmitting signaling information from a first device to a second device, wherein data transmitted between the first device and the second device is encoded using a first block coding scheme, the process comprising acts of:

(A) encoding the signaling information as one or more first sequences of bits;

(B) multiplexing the one or more first sequences of bits with first data encoded in accordance with the first block coding scheme to produce a first stream of data encoded in accordance with the first block coding scheme;

(C) transmitting the first stream of data from the first device to the second device;

(D) de-multiplexing the one or more first sequences of bits from the first stream of data; and

(E) decoding the one or more first sequences of bits into the signaling information.